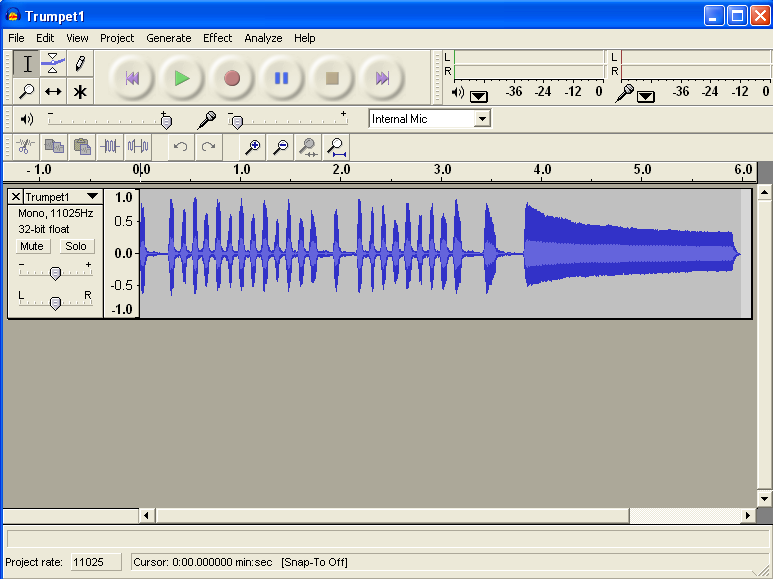
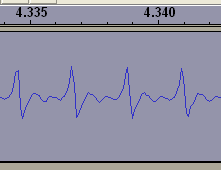
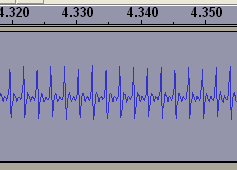
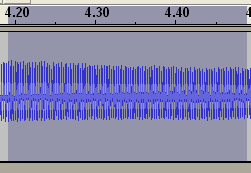
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**Complex Wave Forms – (Audacity)**

* Click on the Moodle link to “Trumpet.wav” – save the file to “My Documents”.
* Open Audacity and then open Trumpet.wav – File/open
* Audacity can be found in “Core Programs” in college. If you do not have Audacity at home, you can download it for free from <http://audacity.sourceforge.net/download> -- a 2.1 MB download



* Click the play button, and listen to the rousing tones.
* Now zoom in on part of the final note – Left Click and drag to highlight a small section. Then click several times on the magnifying glass +. We should go through the images below, each one zooming in more.

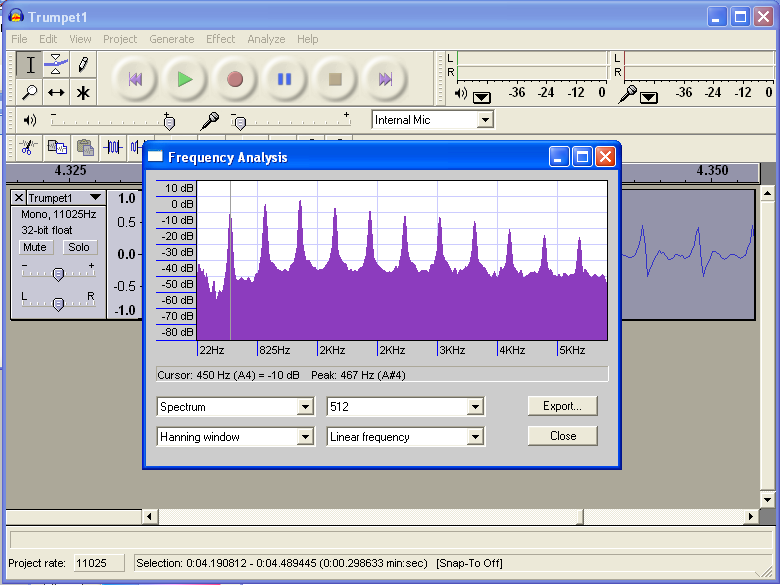


* As you can see, the waveform has a repeating pattern, but it does not look like a sine wave. In fact this repeating pattern (and any other repeating pattern) can be made by adding together a number of sine waves.
* Go back to Audacity, and click “Analyse/Plot Spectrum, a new window opens. If we hover the cursor over the first peak we get some useful information in the grey panel below. In this case it says:

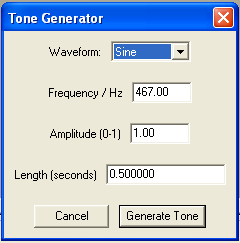
Cursor – 450Hz - -10dB (The dB refers to the amplitude at this frequency – and yes it is a minus!.)

Peak – 467Hz

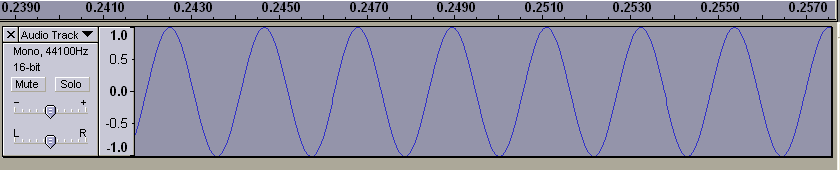
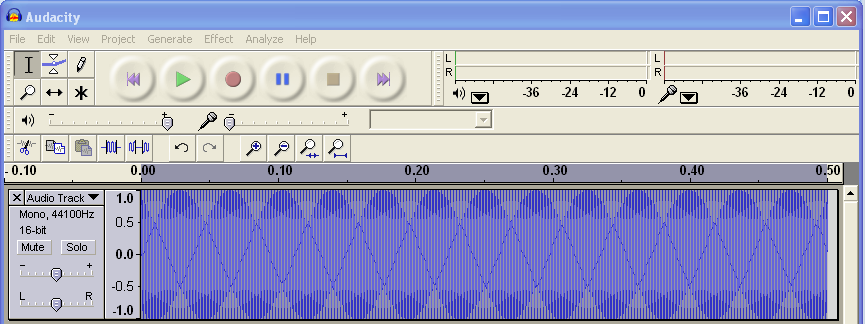
We are interested in the Peak Frequency and the dB level. It might be better to slowly move the cursor left to right across the peak to get the dB level.



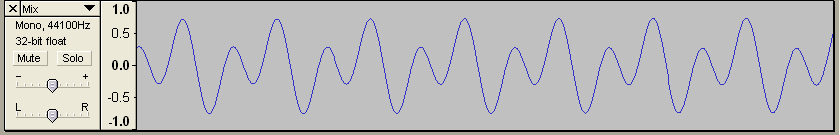
* In Audacity start a new wave form – File/New



* And Generate a new tone – Generate/Tone – enter the frequency of the first harmonic and set the length to 0.5 seconds (see right).
* An odd looking wave form will appear (see below). This is in fact an alias, and if we zoom in a perfect sine wave is revealed.



* We now need to amplify the signal to take account of its dB reading, -- Effect/Amplify – and insert the dB value. In my case entering -10 results in a wave of decreased amplitude.
* Now we generate the second Harmonic, and adjust its amplitude.
* Then we add the 2 waves together. First we select both waves (Ctrl A). Then we add them – Project/Quick Mix, to generate something similar to the picture below.



* Repeat this process of adding harmonics, to generate a more and more complex wave form. It is possible to add more than one wave form together.
* You can play the sound in Audacity whenever you choose.

**Submit your work**

* Save your work as a .wav file –File/Export as WAV. Remember to include your name in the file name.
* Submit this file through Moodle – “Complex Wave Forms – Submission”
* When you have completed the square wave assignment below, also submit this, remember to give it a different file name.

**Square Wave**

* A square wave can be generated by adding sine waves! Again we can do this in Audacity, by adding the odd harmonics, at decreasing amplitudes.
* First generate a tone, shall we say 1000Hz for 0.5 seconds.
* Next generate the second tone, this must be 3 x frequency (3000Hz) and 1/3 amplitude, set this in the generate window (Amplitude 0.333)
* You can add these 2 frequencies together – Project Quick Mix.
* The third frequency is 5 x (5000Hz) at 1/5 amplitude.
* The 4th frequency is 7000Hz at 1/7 amplitude.
* Already you should see a close approximation of a square wave!
* Keep this up until you become fed up!